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...ng Department of Environmental Quality
Air Quality Division

PERMIT APPLICATION ANALYSIS

NAME OF FIRM:	Solvay Soda Ash Joint Venture
RESPONSIBLE OFFICIAL:	Richard Casey, Vice President
ADDRESS OF FIRM:	P.O. Box 1167 Green River, Wyoming 82934
TELEPHONE NUMBER:	(307) 875-6500
TYPE OF OPERATION:	Trona Mine & Soda Ash Chemical Production Plant
LOCATION OF PLANT:	NE¼, Section 31, T18N, R109W, Sweetwater County, Wyoming (the plant is located about 15 miles west of the town of Green River, about 2 miles south of I-80)
PROPOSED PROJECT:	"D" Process Line Construction/1.2 MM TPY Expansion

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PURPOSE OF APPLICATION:

Solvay is proposing to expand their soda ash (sodium carbonate) production capacity at their Green River Plant by approximately 1.2 million tons per year; from a current 2.40 MM TPY, up to a total 3.6 MM TPY. This production increase will be accomplished by constructing a full new trona processing and soda ash production train, the fourth such train at the facility. This new process line will be identified as "D" train.

Major equipment proposed for the project includes a new 50,000 ton covered ore storage building; the addition of new primary cone crusher and screening loop equipment; a 400 MM Btu/hr natural gas fired calciner; a 200 MM Btu/hr natural gas fired dryer; associated dissolving, filtering and evaporating equipment; a 100 MM Btu/hr natural gas fired boiler, and two new 10,000 ton (325,000 ft^3) capacity soda ash product storage silos. Also, the existing mine ventilation shaft will be converted to a second ore production shaft under this expansion, requiring drilling of a third shaft for the revised mine ventilation system.

Process Description

This plant produces soda ash product (sodium carbonate chemical: Na_2CO_3) from trona ore (sodium carbonate/bicarbonate mineral: $Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$), mined underground at the plant site. Current Wyoming Air Quality permits limit this plant to 2.4 MM TPY of soda ash production from no more than 3.8 MM TPY of trona ore. There currently are three separate processing units on plant, identified as the "A", "B" and "C" process trains, respectively. The "D" process train will follow conventional monohydrate soda ash production techniques, using the same basic production steps as the existing three units as described below.

Trona ore is mined underground at the site, hoisted to the surface and then conveyed to a building housing the primary screen. A new mining technique will be implemented at Solvay as part of this expansion, known as "long wall" mining. Ore from long wall mining is expected to be produced in larger size pieces, therefore Solvay is adding a new primary screening and cone crushing loop to the process as part of this expansion.

At the primary screen, run-of-mine (ROM) trona ore is separated into three fractions, with the largest pieces (> 3") recycled to the new primary cone crusher. The fine fraction (< ¼") goes directly to process, while the remaining mid-size fraction goes to a splitter where it can either go to secondary crushing, or to one of two enclosed ore storage buildings. The existing East Storage Building has a capacity of 90,000 tons, while the West Storage Building (to be constructed under this permit), is sized at 50,000 tons.

Trona reclaimed from ore storage, or mid-size fraction conveyed directly from the splitter, is sent to one of four hammermill secondary crushers in the main crusher building to produce pea size (< ¼") refinery feed. The mined trona ore is composed of approximately 85-90% trona mineral, with the remainder consisting primarily of sand and shale. Thus after crushing, the ore must be conveyed to the refinery process buildings for removal of these insoluble contaminants.

The first half of the process takes place in the **calciner/dissolver end**, where trona is chemically converted to sodium carbonate (process called calcining) and then dissolved in water to form "liquor". Calcining takes place in direct gas-fired rotary kilns, where the heat drives off the bicarbonate CO_2 and the water of hydration in the trona crystal. The calcined ore from the kiln outlet spill point

is then dissolved in weak soda ash liquor, forming a strong soda ash solution of the soluble sodium carbonate.

The insoluble rock is left behind in the dissolution process, being separated from the liquor in a series of settling and filtering steps. The largest sand/shale particles drop out in a tank and are pulled out by a piece of equipment called a rake classifier. Then the liquor is fed to thickener tanks where the smaller particles settle and can be removed. Finally, the liquor passes through pressure filters to remove the last traces of solid residue.

In addition to insoluble rock, the trona ore is also contaminated with organic matter in varying degrees. This varying organic level causes the trona crystals to appear in color ranging from clear, through shades of yellow, and on to dark brown "root beer" trona. Thus the soda ash liquor also picks up this yellow tint, which must be removed to produce the desired product purity. Activated carbon is used to remove these organics, with this carbon being mixed in powdered form into the soda ash liquor prior to completing pressure filtering. The carbon adsorbs the soluble organic impurities, removing the "color" from the liquor, and the used carbon is picked up with other insolubles in the last of the filters.

The second half of the process takes place in the **evaporator/dryer end**, where the soda ash liquor is concentrated in steam heated triple-effect evaporators to drive off excess water from the liquor, producing purified soda ash crystals. The wet soda ash crystals are centrifuged to dewater them, and then the crystals are conveyed to dryer kilns. "A" and "B" trains have steam tube design dryers, while "C" and "D" trains utilize direct gas-fired rotary kilns. These dryers drive off the remaining free moisture, leaving the final granular soda ash product falling to conveyors at the spill end of the dryer units.

The product is then screened to remove oversize particles, and conveyed to storage silos to await shipment by bulk truck, bulk rail, or in bags. Existing storage capacity includes two 10,000 ton (325,000 ft^3) silos, and four 7,000 ton (225,000 ft^3) silos. Two additional 10,000 ton silos are proposed under this application.

Utility steam is provided for electricity generation and process heat by two 350 MM Btu/hr coal fired **process boilers**. Solvay will install an additional 100 MM Btu/hr natural gas fired boiler under this application, primarily to supply heat for the mine air ventilation system.

Project Emission Sources

Solvay's application indicates that there will be seven new emission points constructed under this project. The major process emission sources will include **(1)** an electrostatic precipitator on the exhaust of the new gas fired calciner (AQD #80), and **(2)** another electrostatic precipitator on the exhaust of the gas fired soda ash dryer (AQD #82). There will also be four housekeeping dust control systems, utilizing baghouses to capture dust from dry ore and soda ash conveyor handling and processing activities. These four systems are identified as AQD #'s 76, 79, 81 and 83. Finally, there will be a new 100 MM Btu/hr capacity natural gas fired boiler installed, identified as AQD #85, primarily for heating mine ventilation air.

In addition, Solvay intends to modify the existing "A", "B" and "C" calciners to increase their design short term production capacity from 162, up to 200 TPH trona feed. This increased capacity will be accomplished by replacing the existing drag conveyors on the spill end of the kilns, with new higher speed bucket elevators

allowing more product removal capacity. Solvay feels that the firing capacity of these three existing calciners is sufficient to adequately calcine the increase trona ore throughput.

Another change planned under this project is the removal of the AQD #2b baghouse that currently services the East Storage Building ore reclaim system. AQD #46, another baghouse control system is located in the vicinity of the East Storage ore reclaim, and Solvay feels that this system has the capacity to absorb the load of the existing ore reclaim pick-up points. Thus Solvay will modify the AQD #46 industrial ventilation system to include these former AQD #2b system hoods.

AQD #47 baghouse control system, the control device for collecting dust emissions from the existing three hammermill crushers, will also be eliminated as part of this project. Solvay has excess capacity in the AQD #2a baghouse, and by modifying the industrial ventilation system of #2a, they intend to control the emission points from the existing three hammermills with this system. The #2a fan will not be changed, however, and that fan's exhaust air volume will simply be re-apportioned throughout the modified collection ductwork. With the same projected exhaust volume, the existing source #2a particulate emission rate will remain at the current level.

Also part of this project, Solvay plans to reduce permitted emissions in eleven existing plant baghouses by changing the basis on which the allowable limits are set. Solvay had estimated emissions from AQD #'s 6b, 10, 11, 14, 41, 44, 46, 64, and 65 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set on this basis in past permits. In this current application, Solvay is proposing to reduce the allowable for these nine sources to 0.01 gr/dscf. The emissions on two other units, AQD #50 "C" train dryer housekeeping and AQD #53 product silo reclaim baghouses, will do even better at 0.005 gr/dscf.

As additional trade-off for new particulate emissions, Solvay will reduce the permit limit on the two existing coal boilers (AQD #18 & 19) from 17.0, down to 5.0 pph (0.0056 gr/dscf) based on recent internal testing and evaluation of control equipment capability by the Solvay technical staff.

Also based on testing results, Solvay will reduce the permit limit on four process dryers (AQD #15, #26, #51 & #73). The particulate allowables for AQD #15 common stack for the "A" & "B" line steam tube dryers' electrostatic precipitators, and the AQD #73 meta-bisulfite dryer scrubber stack, will both be based on 0.015 gr/dscf. Mass emission test results on the AQD #26 Alkaten product dryer baghouse stack show it to operate below 0.006 gr/dscf, while the mass values for the AQD #51 "C" line gas fired dryer electrostatic precipitator stack work out to 0.008 gr/dscf outlet loading.

In another particulate trade-off measure, Solvay will commit to limiting operation of three coal handling baghouses (AQD #'s 10, 11 & 14), and one caustic lime delivery baghouse, to no more than 12 hours per day. These systems control emissions from coal or lime deliveries, which occur intermittently, only during the daytime hours.

Under May '96 permit MD-282, Solvay had permitted expansion of their existing sodium sulfite plant to include a meta-bisulfite (MBS) product variant, along with construction of a new combined product bagging facility. That permit considered installation of four product storage silos for the bagging machine feed, one for each of four products (MBS, sodium sulfite, Alkaten, and soda ash), with a bin vent baghouse assigned to each silo. Solvay subsequently decided that the new soda ash silo could be serviced by the existing AQD #53 main soda ash silo storage vent

baghouse control system, thus the new planned bin vent for the bagging soda ash silo was no longer required. Therefore the MD-282 permitted source, AQD #69, was never built, and this analysis acknowledges removal of that source from the Green River plant emission inventory.

In addition to the elimination of AQD #69, Solvay recently notified the Division of other changes to the actual configuration of emission sources constructed under the MD-282 permit (5/29/97 letter). These changes included abandoning the former AQD #40 sulfite bagging system, and relocating that old baghouse for service on the new AQD #72 MBS process soda ash feed bin. Stack exhaust volume was revised for the product loading storage silo bin vents (AQD #'s 68, 70, 71 & 72), and as above, Solvay reduced allowable emissions from 0.02, down to 0.01 grains per dry standard cubic foot of exhaust (gr/dscf) for these four sources. The Division acknowledged that the MBS/bagging system revision proposal resulted in reduced potential emissions (6/27/97 letter), and informed Solvay that the allowable emission changes would be codified in this permit. Thus the emission calculations of this permit also incorporate these changes to the "Bagging Facility/MBS Plant".

This permit will also acknowledge the existence of nitrogen oxide and volatile organic compound emissions, from a small natural gas burner on the AQD #26 Alkaten product dryer. This source has existed since its installation under July '86 permit CT-643A, but identification of NO_x and VOC emissions from the source was just recognized in the preparation of this current application.

Solvay has also corrected the system exhaust volumes (flow rates) of a number of existing emission sources. These corrections are identified in the individual descriptions of existing sources modified under the application.

Finally, this application will formally consider the existence of VOC emissions from the mine vent system. The mine vent has existed at the plant from its inception, but it has only recently been determined such vents are the source of significant emissions. As noted previously, under this project Solvay will drill a new shaft for the revised mine configuration ventilation system, however emissions are not expected to vary significantly from the existing vent shaft.

REPORTED PROCESS RATES:

As indicated above, this expansion will produce approximately 1.2 million tons per year of monohydrate soda ash (137 TPH dryer production average for full year, 8760 hours operation). To yield that tonnage, the existing three calciners will each process a maximum of 200 TPH of trona ore, while the new "D" calciner will be designed for 275 tons per hour ore feed.

Solvay's maximum hourly process rates after completion of this expansion project are shown in Table A, along with a comparison between the annual production at full load, full year (8760 hrs) operation and the design capacity sought through the permit application.

Table A: Solvay Design Process Rates

Unit	Calciner Kilns: Trona Ore Feed Rate (TPH)	Calciner Kilns: Calcined Ore Production Rate (TPH)	Trona Ore Feed Rate Capacity @ Full Load (MMTPY)	Design Annual Trona Ore Feed Rate (MMTPY)
#17 "A" Calciner	200	147	1.752	1.577
#17 "B" Calciner	200	147	1.752	1.577
#48 "C" Calciner	200	147	1.752	1.577
#80 "D" Calciner	275	202	2.409	2.048
Totals	875	643	7.665	6.779

Unit	Dryer Kiln: Wet Crystal Feed Rate (TPH)	Dryer Kiln: Soda Ash Production Rate (TPH)	Soda Ash Production Capacity @ Full Load (MMTPY)	Design Annual Soda Ash Production (MMTPY)
#15 DR-1 Dryer	93	76	0.666	0.594
#15 DR-2 Dryer	93	76	0.666	0.594
#28 DR-4 Dryer	40	32	0.280	0.252
#51 DR-5 Dryer	150	122	1.069	0.962
#82 DR-6 Dryer	198	161	1.410	1.199
Totals	563	458	4.091	3.601

POLLUTANTS EMITTED:

Particulate matter (TSP/PM_{10}), nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC's) are the major pollutants that will be emitted as a result of this project.

Regarding particulate, the stack emission control equipment is not 100% efficient at catching dust, therefore some particulate matter will be emitted in the form of trona or soda ash dust from the stacks of the trona calciner, the soda ash dryer, and from the housekeeping baghouses constructed under this project.

NO_x will be the primary pollutant coming from combustion of natural gas in the trona calciner, the soda ash dryer and the new 100 MM Btu/hr boiler. Carbon monoxide (CO) is also emitted from natural gas combustion, but because ambient standards are so much higher for this pollutant, it is not as important an emission in this analysis. Also emitted from natural gas combustion are trace amounts of unburned hydrocarbon fuel that slips through the burners, and the combustion products of fuel impurities such as ash and sulfur. The ash and sulfur content of the natural gas fuel is negligible and will result in inconsequential emission rates of particulate matter and sulfur dioxide. Carbon dioxide, the product of complete carbonaceous fuel combustion, will also be emitted from natural gas combustion, but CO_2 is not considered a pollutant of local concern at this point in time.

Volatile organic compound emissions (VOC's = non-methane, non-ethane organic compounds) have been found to be emitted from various trona processing operations, driven off from organic contaminants in the trona ore. The VOC emission components

possibly originate from the oil shale that is mined around the edges of the trona ore deposits, or from organic contaminants within the trona ore, itself. The VOC's may contain individual pollutant species which are listed under Title III of the U.S. Clean Air Act Amendments of 1990, as hazardous air pollutants (HAP's).

Finally, there will be emissions coming from the mine air vent system, as VOC contaminated exhaust from the mining operation escapes to the atmosphere.

The applicant has reported that testing of the existing calciners has revealed CO, VOC, and HAP emissions due to the calcination process. As reported by the applicant, due to the extreme variability of the emission rates tested and the limited number of samples, a very conservative approach to determine maximum emission rates of these pollutants was utilized. A statistical analysis of stack test results was done to derive the expected average and maximum hourly emissions. The average emission rate was calculated, then to it is added 3 times the standard deviation. Statistically, this result depicts the maximum hourly emission rate with a confidence level of 99.7%.

EMISSION CONTROL MEASURES PROPOSED:

Solvay has not yet made a final selection of the control equipment that will be installed under this project, but they have specified the exhaust rates and emission control that these pieces of equipment will be designed to achieve. As a permit condition, the Division will require that these pieces of control equipment meet the design specifications and comply with the emission limits as considered in this permit analysis. Also Solvay will be required to supply details of the final equipment selection after the alternatives are considered.

Major emission sources proposed in this permit application include:

AQD #80 "D" Train Trona Ore Calciner Precipitator

The new trona calciner will be fired with natural gas, with a design firing capacity of 400 MM Btu/hr. The burner will be designed for "Low NO_x" performance, with a NO_x emission rate of 0.05 lb/MM Btu, or 20.00 pph. At the 275 TPH design trona feed rate of this unit, the process emission factor will be 0.073 lb/ton ore feed.

Solvay is proposing to use an electrostatic precipitator, designated source AQD #80, to control particulate emissions from this calciner stack. The ventilation system will be designed to handle 264,000 actual cubic feet per minute (95,300 dscfm) of exhaust through a 10'6" diameter stack (3,049 ft/min exit velocity). Solvay has certified that this precipitator will meet an outlet particulate loading of 0.015 grains per dry standard cubic foot of exhaust, which works out to 12.25 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has projected maximum VOC emissions from trona based emissions and gas firing, of 1.94 pounds per ton of ore throughput. For the 275 maximum TPH process rate, this works out to 533.50 pph for this calciner.

CO emissions also exist from trona calcining, with some CO coming from the fuel combustion at the kiln burner, and a significant portion coming form partial combustion of the hydrocarbons driven off the trona ore in the hot environment of the calciner kiln. From plant testing on this sources, Solvay has projected maximum CO

emissions from trona based emissions and gas firing, of 3.81 pounds per ton of ore throughput. For the proposed 275 TPH maximum process rate, this works out to 1047.75 pph for the calciner. The burner manufacturer guarantees a CO emission rate of 0.07 lb/MM Btu from fuel firing, or 28 pph for this 400 MM Btu/hr burner based on 46 ppmv CO concentration. This shows that over 97% of the total projected CO from calcining are tied to process throughput.

AQD #82 "D" Train Soda Ash Rotary Dryer Precipitator

The new soda ash dryer will be direct fired with natural gas, with a design firing capacity of 200 MM Btu/hr. The burner will be designed for "Low NO_x" performance designed to meet a NO_x emission rate of 0.15 lb/MM Btu, or 30.00 pph. At the 198 TPH design wet mono crystal feed rate of this unit, the process emission factor will be 0.152 lb/ton wet feed.

Solvay is proposing to use an electrostatic precipitator, designated source AQD #82, to control particulate emissions from this dryer stack. The ventilation system will be designed to handle 130,000 actual cubic feet per minute (40,200 dscfm) of exhaust through an 8 ft. diameter stack (2586 ft/min exit velocity). Solvay has certified that this precipitator will meet an outlet particulate loading of 0.010 grains per standard cubic foot of exhaust, which works out to 3.45 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has projected maximum VOC emissions from natural gas firing, based the AP-42 Table 1.4-3 emission factor of 1.4 lb/MMCF of gas fired (83% of TOC) for "large industrial boilers". At a heating value of 1035 Btu/ft^3, the dryer burners will consume 193,237 CFH of fuel, working out to 0.27 pph for this dryer. Solvay's testing has indicated that the VOC contribution from the soda ash process material is negligible.

The burner manufacturer guarantees a CO emission rate from the AQD #82 soda ash dryer of 0.07 lb/MM Btu from fuel firing, or 14 pph for this 200 MM Btu/hr burner based on 42 ppmv CO concentration in the exhaust.

AQD #85 Gas Fired Boiler

Solvay is proposing to install a 100 MM Btu/hr natural gas fired boiler, designated source AQD #85, to be used primarily for supplying heat to the mine ventilation system. The boiler is rated to produce 100,000 pph of steam while burning 96,618 SCFH of natural gas fuel (H.V. ~1035 Btu/ft^3). This boiler will have a "Low NO_x" burner system with a guaranteed design NO_x emission rate of 0.038 lb/MM Btu. This type of performance is typically achieved with an elongated "Low NO_x" burner flame configuration, using flue gas recirculation and low excess air. Solvay notes that final design of the boiler is still incomplete, but they note that possible other design parameters include:

1) extended surface in the boiler convection section to improve boiler efficiency by reducing gas pressure drop and exit gas temperature,

2) water cooled front wall to prevent reradiation of energy from the refractory, to lower flame temperature and NO_x formation, and

3) staged burner fuel combustion to reduce NO_x formation in the in the combustion process.

Thus Solvay is certifying that this boiler will emit no more than 3.80 pounds per hour of NO_x.

Solvay burner manufacturer has also guaranteed CO emissions of 0.09 lb/MM Btu from this boiler, or 9.00 pounds per hour at the 100 MM Btu/hr design firing capacity based on 90 ppmv CO concentration in the exhaust.

The industrial ventilation system fan on this boiler will be designed for 42,000 actual cubic feet per minute (22,275 dscfm) of exhaust air, leading to a 3.0 ft. diameter outlet stack (5,942 ft/min exit velocity). Because it burns only natural gas, Solvay has projected minimal particulate emissions based again on AP-42 emission factors. The Table 1.4-1 emission factor for particulate on "large industrial boilers" is 5.0 lb/MMSCF. At the 96,618 CFH design fuel use rate, particulate emission work out to 0.48 pph for this dryer.

Solvay also projected VOC emissions from the boiler based on AP-42 emission factors from Table 1.4-3 for gas firing. At the 2.8 lb/MMCF factor for on "small industrial boilers" (48% of TOC), and 96,618 CFH design fuel use rate, VOC emissions work out to 0.27 pph for this dryer.

Although AP-42 also provides an emission factor for SO_2, the Division is satisfied that the specified sulfur content of normal pipeline gas is trivial and sulfur dioxide emissions are negligible.

Housekeeping emission sources proposed in this permit application include:

AQD #76 Primary Screening Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #76, to collect trona dust from vents associated with the new primary ore screens and the discharge of that system to distribution conveyor belts. This industrial ventilation system fan will be designed for 36,000 actual cubic feet per minute (28,600 dscfm) of exhaust air, leading to a 3'8" ft. diameter baghouse stack (3,409) ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 2.45 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #79 Main Crusher Building Hammermill Feed Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #79, to collect trona dust from transfer points on the discharge end of the conveyor system carrying the reclaim ore from the West Ore Storage Building to the hammermills in the main crusher building. This industrial ventilation system fan will be designed for 12,250 actual cubic feet per minute (9,800 dscfm) of exhaust air, leading to a 2'1" diameter baghouse stack (3,594) ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 0.84 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #81 Soda Ash Dryer Area Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #81, to collect soda ash dust from transfer points and screens in the soda ash dryer product handling area of the main process plant. This industrial ventilation system fan will be designed for 10,000 actual cubic feet per minute (5,800 dscfm) of exhaust air, leading to a 1'8" diameter baghouse stack (4,584 ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 0.50 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #83 Product Storage Silo Feed Area Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #83, to collect soda ash dust from bin vents and product transfer points at the top of the two new soda ash storage silos. This industrial ventilation system fan will be designed for 7,500 actual cubic feet per minute (4,750 dscfm) of exhaust air, leading to a 1'8" diameter baghouse stack (3,438 ft/min exit velocity. Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 0.29 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

Existing process sources which will be modified under this expansion include:

AQD #15 Dryer 1 & 2 Scrubber Stack

Solvay currently controls particulate emissions on the DR-1 and DR-2 steam tube dryer exhaust streams using twin model 59/126 Type VVO Ducon venturi scrubbers, with the common exhaust stack designated source AQD #15. The industrial ventilation fan for this system is designed for 83,100 actual cubic feet per minute (33,750 dscfm) of exhaust air, leading to a 6 ft. diameter baghouse stack (2,939 ft/min exit velocity). As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #15 scrubber stack by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #15 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 6.80 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this scrubber stack exhaust will meet an outlet emission loading of 0.015 grains/dscf of exhaust. At the currently specified 33,750 dscfm, this works out to a revised allowable particulate emission rate of 4.34 pounds per hour.

The stack also emits NO_x emissions limited to 1.20 pph. From plant testing on other similar sources, Solvay has determined total VOC emissions from this boiler to be fuel related, thus based on AP-42 emission factors, the unit emits 0.06 pph of VOC. No changes are planned for the burner operation or control equipment, thus these gaseous pollutant emission rates will not differ from the current projection.

AQD #17 "A" & "B" Trona Ore Calciner Precipitators Common Stack

The AQD #17 stack emits the exhaust from both the "A" and "B" train trona calciners, currently rated to process 162 TPH of trona ore feed, each. As noted earlier, Solvay plans to increase that design feed rate up to 200 TPH trona feed on each unit by installing new higher speed bucket elevators at the outlet to improve product removal capacity. The burners on each of these calciners have an existing design firing capacity of 200 MM Btu/hr, however Solvay has indicated that they feel these units can operate over-design up to 250 MM Btu/hr in this service. Thus Solvay feels that the firing capacity of these burners is sufficient to adequately calcine the increased trona ore throughput. The burners are designed for "Low NO_x" performance and they had been rated for a NO_x emission rate of 0.05 lb/MM Btu. Subsequent internal testing has indicated to Solvay that a NO_x control performance of 0.06 lb/MM Btu, is more appropriate. Thus each calciner will move from 10 pph NO_x emissions (0.05 @ 200), up to 15 pph (0.06 @ 250), and the AQD #17 stack will have an allowable NO_x emission limit of 30.00 pph, based on both "A" and "B" calciner emissions. This works out to a 0.075 lb/ton ore feed factor considering the new 200 TPH design trona feed rate for each unit.

There are existing electrostatic precipitators for particulate emission control on each of these calciners. The revised ventilation system for the AQD #17 stack will be designed to handle 312,000 actual cubic feet per minute (120,424 dscfm) of exhaust through a 12 ft. diameter stack (2,759 ft/min exit velocity). Internal Solvay testing has indicated that the precipitators can handle this increased ore throughput, and still meet the current 22.30 pph particulate emission limit. Thus the outlet grain loading will be 0.022 grains per standard cubic foot of exhaust.

From plant testing on this source, Solvay has projected maximum VOC emissions from trona based emissions and gas firing, of 1.94 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 314.28 pph for each calciner, while for the proposed 200 TPH maximum process rate, this works out to 388.00 pph for each unit. Thus the AQD #17 stack will now have a VOC emission rate of 776.00 pph.

CO emissions also exist from trona calcining, with some CO coming from the fuel combustion at the kiln burner, and a significant portion coming form partial combustion of the hydrocarbons driven off the trona ore in the hot environment of the calciner kiln. From plant testing on this sources, Solvay has projected maximum CO emissions from trona based emissions and gas firing, of 3.81 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 617.22 pph for each calciner, while for the proposed 200 TPH maximum process rate, this works out to 762.00 pph for each unit. Thus the AQD #17 stack will now have a CO emission rate of 1524.00 pph.

AQD #18 & #19 Coal Boiler Scrubber & Precipitator Control Systems

Solvay currently operates a Flakt Spray Tower Flue Gas Desulfurization (FGD) Scrubbers and Flakt Type FAA 5x32-66120-2 Electrostatic Precipitators to control emissions from the exhaust of the 350 MM Btu plant coal fired boilers, designated sources AQD #18 and AQD #19. The industrial ventilation fans for these systems are designed for 143,676 actual cubic feet per minute (103,500 dscfm) of exhaust air, leading to 7'4" diameter precipitator stacks (3,480 ft/min exit velocity). As mentioned in the project description, Solvay has committed to reducing permitted particulate emissions from these stacks as additional trade-off for new emission sources, based on recent internal testing and evaluation of control equipment capability by the Solvay technical staff. Solvay had projected emissions from the